

29. Samojloff, A.: *Wielero Beiträge zur Elektrophysiologie des Herzens.* Arch. f. d. ges. Physiol., 1910, cxxxv, 417-468.
30. Smith, F. M.: The ligation of the coronary arteries with electrocardiographic study. Arch. Int. Med., 1918, xxii, 8-27.
31. Smith, S. C.: The clinical value of electrocardiography. Penn. Med. Jour., 1917, xxi, 10-18.
32. Waller, A. D., and Reid, E. W.: On the action of the excised mammalian heart. Phil. Tr. Roy. Soc. London, 1887, clxxviii, 215-256.
33. Weber, A., and Wirth A.: Zur Registrierung der Hertzstöße nach O. Frank. Deutsch. Arch. f. klin. Med., 1912, cv, 562-575.
34. Wedd, A. M.: The clinical significance of slight notching of the R wave of the electrocardiogram. Arch. Int. Med., 1919, xxiii, 515-526.
35. Weiss, O., and Joachim, G.: Registrierung und Reproduktion menschlicher Herztöne und Herzgeräusche. Arch. f. d. ges. Physiol., 1908, cxviii, 341-386.
36. Wiggers, C. J.: The contour of the pressure curve in the pulmonary artery. Am. Jour. Physiol., 1914, xxxiii, 1-12.
37. Wiggers, C. J.: Modern aspects of the circulation in health and disease. Philadelphia, Lea & Febiger, 1915, p. 376.
38. Willins, F. A.: Arrhythmization block. Arch. Int. Med., 1919, xxiii, 431-440.
39. Willins, F. A.: Observations on changes in form of the initial ventricular complex in isolated derivations of the human electrocardiogram. Arch. Int. Med., 1920, xxv, 550-564.
40. Wybauw, R.: Sur le point de la systole cardiaque dan l'oreillette droite. Arch. internat. de physiol., 1910, x, 78-89.

ILEAL REGURGITATION, NERVES AND DIET IN THE CHRONIC INTESTINAL INVALID.*

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I. INTRODUCTION. Since 1566¹ it has been known there is a structure called the ileocecal valve, and it has been known since 1570² that the valvular function of this structure is to prevent the regurgitation of feces into the small intestine. Furthermore, it has been known for ninety-eight years³ that the active muscular sphincteric function of the mechanism at the distal end of the ileum is to moderate the flow of the contents of the small intestine into the colon.

Actual incompetence of the ileocecal valve was first produced experimentally in 1586.⁴ This condition has been recognized as a clinical entity for twenty-three years,⁵ and its existence was demonstrated in the human by the bismuth-roentgen method at least eighteen years ago.⁶ Yet Cole,⁶ writing six years ago, was obliged to bemoan the fact that he was unable to arouse any interest in this subject, even on asking if symptoms might be expected, should a patient be fed colonic contents. Cole, Case and other authorities in roentgen work have recognized a correlation in the degree of ileal regurgitation and the severity of the symptoms complained of by

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the patient, and the probable causative connection between ileal regurgitation and many cases of ileal stasis has frequently been pointed out.

Case,⁷ in 1913, reported ileal regurgitation in over 16 per cent. of 1500 consecutive gastro-enterological cases. Cole⁸ believes that one might expect to find, with modern technic, perhaps 30 per cent. of ileal regurgitation. Baetjer⁹ has stated that it is possible to find as high as 50 per cent. of ileal regurgitation by including every case in which a little of the barium enema can be demonstrated to have entered the terminal ileum. Yet even today almost no one can be found who will take more than the most casual interest in this subject in other than a purely academic manner.

If 30 per cent. of all patients coming for gastro-intestinal examination had regurgitation of food into the mouth all the time, someone would soon have to take interest. In the same way if 30 per cent. of all gastro-intestinal patients suffered from chronic rectal incompetence something would certainly get done about it. Yet just because the junction between the ileum and the colon is unable to cause external annoyance to the patient or his friends, nothing gets done about it. It is easy to create a furor about the appendix or a gall-stone but not about the ileocecal mechanism. Why? Possibly because anatomies pass it over with a few lines of small type, medical schools pass it by in parenthesis and students devote their time to something more obvious. Under these circumstances it is scarcely to be wondered at if the victim of ileal regurgitation turns in disgust from physicians who remain ignorant, more than four hundred years after its discovery, concerning an important anatomic and physiologic structure in order to obtain perhaps a little alleviation of symptoms at the hands of some cult not in the regular profession.

The term ileal regurgitation as here used includes not only regurgitation into the ileum resulting from incompetence of the actual ileocecal protective mechanism but also the condition produced surgically by operative removal of the ileocecal area of the intestine; there is thus produced the same condition of continuity between the colon and small intestine. Two such surgically produced cases of regurgitation are included in the present study. For purposes of treatment both these groups of cases are in the same class on account of their lack of a break in continuity between the large and small intestine.

The objects of this paper are as follows:

1. To draw attention to the fact that too little attention is being devoted to ileal regurgitation, a pathologic condition which is a fact and not a theory.
2. To point out the ease and certainty with which the presence of this condition may be determined.

3. To present for consideration a new diagnostic sign of ileal regurgitation which is at least suggestive in value.

4. To indicate the remarkable frequency of ileal regurgitation in the class of cases referred to as chronic intestinal invalids.

5. To indicate the almost constant coexistence of ileal regurgitation and various forms of excessive nervous irritability.

6. To outline a non-surgical method of treatment which has given a reasonable degree of satisfaction.

7. To record the results of such treatment in a consecutive series of fifty chronic intestinal invalids.

II. DIAGNOSIS. (a) Hertz,⁵ in 1897, reported a clinical sign the presence of which was considered by him to indicate the existence of ileal regurgitation. Treatment carried out by him on the assumption of the existence of regurgitation apparently gave satisfactory results. His diagnostic procedure was as follows: One hand is pressed deep across the middle of the ascending colon to block possible distal expulsion of gas in the cecum. Downward pressure with the other hand in the direction of the pole of the cecum will then, if regurgitation exists, result in coarse crepitation and perhaps a gurgling noise as the cecal gas is forced back into the ileum.

(b) Gas is not usually present in the small intestine. The presence of generalized gas throughout the abdomen suggests a deficient ileocecal mechanism.

(c) A cecum and ascending colon dilated with gas combined with a spastic descending colon frequently accompany ileal regurgitation.

(d) In the presence of this condition the hepatic flexure and the sigmoid loop are frequently distended by gas.

(e) A generalized yellowish discoloration of the skin, especially in the distribution areas affected by Addison's disease, is usual.

(f) The eye sign is positive. By the eye sign is indicated a marked dirty discoloration of the whole of both eye sockets. This discoloration is not like other more or less limited discolorations about the eyes with which the writer is familiar. This sign is suggestive, not pathognomonic. It is practically always present, varying in degree with the intensity and duration of the ileal regurgitation. It may be present in the absence of such regurgitation. Should this be the case, however, treatment, as for ileal regurgitation, will cause a gradual disappearance of the sign in the same manner, but more rapidly than is the case when ileal regurgitation has been demonstrated to exist.

(g) The usual complaints of the patient with ileal regurgitation are abdominal pain of various sorts, intestinal gas, constipation and nerves.

The pain complained of may be a slight general abdominal discomfort or it may be associated with the presence of gas, particularly in the cecum, hepatic flexure or sigmoid loop, more rarely in the splenic flexure. A second type of pain in these cases is a high central

epigastrie pain which often becomes confused with that of gastric ulcer; this particular type of pain is frequently relieved by increase of the costal angle through appropriate developmental exercises. A third characteristic type of pain is a transverse soreness of the abdomen, apparently definitely related to the existence of a spastic transverse colon. A fourth type of pain is that due to distress of the heart following pressure from excessive gas in the stomach, resembling in character the heart pain complained of by the typical neurocardiac asthenic patient.

Constipation is almost universal, being usually of the spastic variety, which in the majority of cases shows definite improvement under the administration of atropine.

(h) Diagnosis is absolute by roentgen examination. The presence of a majority of the above signs or symptoms should be sufficient to indicate the necessity for a thorough roentgen examination of the gastro-intestinal tract. This will usually yield more or less negative results if the examination stops short of the administration of an opaque enema, although the previous examination is of value in determining whether the colon is spastic or whether it has become atonic, the latter condition very possibly a later exhaustion stage following the spastic state.

Judging from the relative infrequency with which patients referred to me—often after gastro-intestinal examination by competent roentgenologists—have previously been given an enema, the opaque enema is considered unnecessary; or possibly this omission occurs because, unless it is habitual routine, the administration of the opaque enema is distasteful. There is no doubt, however, that the opaque enema is the most valuable single procedure available today in the study of conditions existing within the colon and at the ileocecal juncture, especially with fluoroscopic observation of the withdrawal or expulsion of the enema at the completion of the usual examination.

In all of the fifty cases here reported the administration of the opaque enema was followed by a study of the filled colon; the enema was then withdrawn, the entire procedure being followed fluoroscopically. Much colon physiology is learned by watching the colon empty itself. If the terminal ileum is filled by regurgitation it usually remains filled until the entire colon empties from cecum to ampulla. The ileal contents thereafter may or may not be seen to follow the course of the colonic contents from cecum to ampulla, the whole distance occasionally being traversed by a block of opaque substance previously in the ileum in the space of a comparatively few seconds. To see a long, ptotic, festooned, loosely attached, M-shaped colon suddenly transform itself into a short omega style colon without evident excess of length anywhere, in order apparently to facilitate the smooth and rapid passage of large blocks of colonic contents, is to get new ideas on whether or not to do frequent fixa-

tion of the colon. Fluoroscopic study of the withdrawal of the opaque enema is certainly too little practised. There is no substitute for this procedure, which if properly carried out is rapid and satisfactory both to the patient and to the observer.

III. FREQUENCY OF ILEAL REGURGITATION On the basis of the observations by Case, Cole, Baetjer and others it would seem that ileal regurgitation may be expected in 20 to 30 per cent. of any series of gastro-intestinal cases. Therefore, if one finds a frequency higher than 50 per cent. in any consecutive series of cases it must be considered distinctly unusual.

In the series of 50 consecutive chronic intestinal invalids upon which this paper is based the existence of ileal regurgitation was demonstrated in 80 per cent. of the cases. Such a high frequency of ileal regurgitation is, to say the least, surprising and calls if possible for explanation.

The technic employed was identical. All observations were made by both Dr. L. B. Morrison and the writer. A large rectal tube was used. The enema was allowed to flow in until the cecum was barely well filled. The flow of the enema was then checked before any evidence of undue distention occurred. No manipulation was indulged in until it had been determined if the barium suspension would be carried back into the ileum by antiperistalsis. Occasionally a half-minute or so would elapse before antiperistalsis became active enough to produce visible ileal regurgitation. Only cases in which antiperistalsis by itself and without external pressure carried the barium back into the ileum were recorded as having regurgitation. On the other hand it may be stated that it was rather unusual to find a case in which factors other than antiperistalsis did cause regurgitation, possibly in view of the precaution taken against overdistention of the cecum. Cases showing regurgitation after changes in position or the strains incident to evacuation of the bowels were not classed as having regurgitation.

After fluoroscopy of the filled colon and the taking of plates as necessary the receptacle containing the enema was dropped to the floor and the emptying of the colon was studied fluoroscopically. This procedure yielded much information concerning colon physiology and cannot be too highly recommended to those interested in gastro-enterology.

In view of the above precautions there is little doubt about the facts in relation to this 80 per cent. frequency of ileal regurgitation in the group of cases studied.

Consequently, it seems necessary to look for some underlying reason for such frequency in connection with the condition of the patients themselves. The inference is that this astonishingly high frequency of regurgitation found in these cases may be considered as a factor worthy of attention in the carrying out of any treatment directed toward improving the general health of the patients presenting this condition.

IV. FREQUENCY OF THE EXISTENCE OF NERVES. The complaint of nerves, sometimes of most bizarre type, seems almost constant in the chronic intestinal invalid. In fact, there was but one case in fifty which did not complain of some form of increased nervous irritability or tension. The frequency of this complaint in the series of cases under consideration is therefore 98 per cent. One example is sufficient to indicate the curious manifestations of nerves which these patients may present.

Mr. R. P., sculptor, white, aged thirty-five years, single, height six feet, weight 205 pounds, with good habits, brought up on a Western ranch, was first seen October 7, 1919.

Family History. Father died of cancer of the rectum at sixty-six years of age, family history otherwise negative.

Personal History. Patient lived always in the open, mostly on horseback, until the age of twenty-two. He could always keep up with the others in doing heavy, physical labor, but he "always felt as though he weighed a ton," and never liked exercise, feeling that he always expended excessive energy for the results produced. Patient had measles at eight, mumps severely at fourteen and scarlet fever at sixteen. Otherwise the early history was negative. Patient began to worry about the future at twelve to fourteen years of age, probably on account of the straightened circumstances of the family. He always had a desperate desire to study art, and has been active in sculpture for the last fifteen years.

Present Illness. Nervous, worried easily, gets along, but uses up excessive energy. Has never collapsed, but frequently has difficulty in controlling his temper, and after the close of any strenuous session with students or others is likely to get weepy. Has fainted four times, the last two times after being waked up at night by abdominal cramps. These occasions were one year ago and two nights before first coming for advice. On the latter occasion patient woke up with abdominal cramps, promptly fainted and was not normal for an hour.

Patient complains of a "woozy feeling in the lower jaw" and "a hot spot on the crown of the head, roughly circular in shape, about three inches in diameter, approximately in the position of a priest's tonsure." This hot spot has been present for many months and can be accurately outlined with the finger. The existence of this hot spot has seemed parallel to a decreased efficiency in the power of expression of thought and other forms of mental concentration. Patient has suffered intermittently from coxalgia, this condition having been almost constant for the past few months.

Physical Examination. Physical examination in general negative, the patient being tall, with a large frame and very sloping shoulders. The musculature is at present deficient. Posture fair. Skin negative except for some discoloration, and numerous pimples on the back. Pulse, 65; blood-pressure, 140-90. Eye sign positive.

Gastro-intestinal roentgen examination, beginning October 9, showed a sluggish stomach, with slight pyloric spasm, normal duodenum and normally shaped colon. The ileocecal valve was incompetent, the last one or two feet of ileum remaining filled after the evacuation of the enema. The ileum seemed sluggish in action. To promote possible action the patient was given a half glass of water to drink. Twenty to thirty seconds afterward the terminal ileum was suddenly and completely evacuated, after two definite and very vigorous forward and backward movements of the block of opaque substance contained in the ileum. It was very striking to observe this sudden activity of the ileum apparently as a result of the ingestion of a half glass of water.*

Treatment. Active treatment, chiefly by diet and exercise, commenced on October 11, 1919. Improvement was rapid and continuous. On October 25 the patient reported that the hot spot on the back of his head had been gone for twenty-four hours and that his head was clearer. On October 29 the patient stated there had been no return of the hot spot and that his head was perfectly clear. He said that he had done a hard day's work, during which he had not felt tired as usual. He considered himself cured of his nerves and had no more coxalgia. On November 5 the patient reported that he was "feeling fine." He stated that he was convinced that an excessive use of food had been a serious factor in his condition and that he would hereafter be distinctly temperate both in food and candy. He said that he was very pleased because he had been able to do a real piece of constructive writing for a report which had been accepted as a unanimous opinion by the committee on which he was working. He also stated that this was the first time for nearly two years that he had felt his head to be in good order for intellectual purposes. On December 3 the patient wrote that he was "too well to waste time or money on doctoring."

V. RELATION OF ILEAL REGURGITATION TO NERVES. Since nerves of some kind were present in 98 per cent. of the fifty cases and regurgitation was present in only 80 per cent. the nerves cannot be said to be always secondary to ileal regurgitation. A study of the 20 per cent. of cases in the series free from ileal regurgitation gives the following results.

The ten chronic intestinal invalids with nerves but with normal ileocecal mechanism were divided between the herbivorous and carnivorous human types¹⁰ in the proportion of 6 to 4. In the herbivorous group, however, one-half the cases had a definite organic lesion, as a possible cause for nervousness. In the remaining herbivorous cases, and in all of the four carnivorous cases, there was no obvious cause for nerves outside the neuropsychiatric sphere. It is probable that overwork, mental worries and fatigue were

* This observation has been repeated, and the procedure outlined has been found useful on numerous occasions since the above was written.

factors in all cases. It is of interest, however, that none of the carnivorous cases had an organic factor. This is directly in line with the results of a study reported by Hodskins¹¹ concerning human type and the etiology of epilepsy following suggestions by the writer.

As a result of the above it seems probable that ileal regurgitation acts, if at all, only as a precipitating factor, which promotes, possibly through chemical metabolic means, nervous irritability. This is the more probable, in view of the fact that various small forms of superficial nervous irritability disappear rapidly after the application of a diet directed toward preventing the usual undesirable symptoms of ileal regurgitation, parallel with the improvement noted in the functioning of the digestive system. After this comparatively rapid primary improvement, however, there then remains the fundamental irritability of the nervous system, varying with the individual, to be combated by appropriate therapeutic procedures.

VI. TREATMENT. Treatment is divided into the early, intermediate and late stages of convalescence. In general, during the early stage, the objectives are external and internal rest, varied by carefully controlled periods of exercise. This means that after perhaps a few days of complete bodily rest, if this be deemed essential, the patient, if as usual ambulatory, takes up again his daily life, but with the work periods broken as nearly as possible by five-minute rests every half-hour during the day. This specification is based upon the principle that rest from fatigue is effective inversely according to the duration of the preceding fatigue periods. Internally, rest is obtained by the utilization of the simplest, softest bland diet which can be made satisfactory to the patient. At this time eggs, meat and fish are absolutely contra-indicated, as being potentially putrefactive substances. The duration of the early stage of convalescence covers usually from one week to one month.

The intermediate stage covers perhaps the next two months of convalescence. During this period the diet is gradually amplified and the patient begins to approximate more nearly normal conditions in the manner of his daily work. During this stage it is important to warn the patient that it is impossible to expect continuous recovery. The usual sequence of events is that the proportion of good days to bad increases and that the intensity of the undesirable complaints becomes less. As a rule there will be at least two or three opportunities to demonstrate to the patient the fallacy of his allowing himself full liberty of action simply on account of a sensation of well-being too early in the progress of convalescence. The invariable result of this procedure is subsequent collapse, or at least a definite setback in progress, and there is usually opportunity to prove that a single indiscretion may not be wholly recovered from for as much as one or two weeks. The word indiscretion is applied both to the expenditure of bodily and mental effort and to the excessive use of undesirable foods.

The late stage of convalescence covers from two or three months to a year or more, since if the patient has properly learned his lesson he may continue to improve in a general way over perhaps two or three years. This is a period of active experimentation on the part of the patient. Having learned his lesson it is for him to determine how nearly he can approximate a so-called normal standard of work and then to realize that every excess beyond his own limit must be paid for by a relative return of the symptoms from which he has become free. It is therefore for him to determine whether the emergency justifies the sacrifice which he knows must follow.

There are five totally distinct factors of value in treatment. These are grouped under the following headings:

1. Social.
2. Mental.
3. Dietary.
4. Orthopedic.
5. Glandular. •

They are discussed at some length in another paper,¹² three paragraphs from which are here quoted.

"The dietary employed is based in part upon a consideration of the large amount of work by many reputable investigators, which tends to prove the ease with which the intestinal flora can be changed by a modification of diet, also upon a consideration of the fact that ileal regurgitation is an exceedingly common finding in the chronic intestinal type of invalid. Ileal regurgitation was, for instance, demonstrated in 80 per cent. of a consecutive series of fifty chronic intestinal invalids. Eggs, meat and fish, as being potentially putrefactive, are at first absolutely excluded from the dietary and the use of milk is restricted to the amount ordinarily employed in cooking. After a few weeks of complete exclusion of the above foods it is very common to find that the patient's skin is distinctly less muddy. Slowly the yellowish color of the skin is replaced by white and then by pink, a transition which is greatly appreciated by the average woman patient. During this preliminary period of marked restriction of the diet bran and the coarse vegetables are eliminated. No diet list is given, the patients being thus required to use their own brains in the working out of a suitable dietary. One advantage of this system is that the patient gradually acquires an adequate dietary for which he has the least possible dislike. If the dietary actually employed by the patient is written out and continually checked up at successive visits the results seem better from the point of view both of interest of the patient and of the physician, than if a diet slip is handed the patient at the first visit. Eggs, meat and fish are rigidly excluded from the diet for at least one month. During the latter part of this month, however, there is an increasing use of eggs as a flavoring in puddings or other cooked dishes, in which the eggs are finely divided by mixture with the various carbohy-

drates or vegetables. Meat gravies as relishes precede the use of meats as such. During the month of restricted diet, liberal use is made of two special articles of food in conjunction with the usual fruits, starches, vegetables and fats. These two articles are cream cheese (or perhaps the ordinary cheese when used as a flavoring in various cooked dishes) and gelatin. The frequent use of flavored gelatins in the form of salads or desserts is encouraged. The necessary minerals and the water and fat soluble vitamins are provided for by the use of raw fruit and green vegetables and a good grade of butter. In this connection it is surprising to discover how few people are acquainted with the virtues, both from a financial and an economic point of view, of chopped raw cabbage. This food as a salad with French dressing has been taken time and time again without the slightest discomfort or after-effects by patients who had previously stated that they could not possibly eat such a coarse vegetable.

At the end of a month or six weeks if the progress of the patient justifies it—as evidenced by decreased constipation, lessened irritability, lessened disturbance from gas, better appetite and sleep, better color of the skin, and fewer headaches—meat is put back into the dietary at first once a week. The intervals between the days on which meat is used are thereafter shortened according to circumstances. But in the chronic intestinal invalid it has been found most unusual, if meat, eggs or fish as such can be handled with comfort more frequently than two or three times a week. The intermittent use of eggs, meat and fish has another virtue in addition to its economy and its tendency to discourage the growth of undesirable intestinal flora. If the patient has only to wait over one or two days of restricted diet before being allowed a day of full diet, there seems to be much less desire for large quantities of these potentially putrefactive foods, which are handled with difficulty certainly in all patients with demonstrated ileal regurgitation.

In practice, on completion of the history, physical examination and the routine roentgen examination of the gastro-intestinal tract, of which fluoroscopic study of an opaque enema is an essential element, the social and mental factors receive first consideration in the progress of treatment. As soon as these factors are, so to speak, stabilized the diet is taken under serious consideration. In conjunction with diet frequent use is made of mineral oil, agar, yeast and atropin, and every attempt is made to take advantage of habit formation and the natural rectal reflexes. As soon as the diet has become satisfactory the application of orthopedic procedures follow, and finally comes the use of the glandular preparations when indicated. Thus by the end of the first month or so all five of these totally independent factors are being simultaneously employed in the effort to bring about as rapidly as possible an improvement in the general condition of the patient. Belts are rarely used, since

they tend to decrease the faith of the patient in his own ability to carry himself through his day's work. Only slight attention is paid to the question of weight, provided there is not a progressive loss in weight. Not infrequently one may find an apparently healthy person of almost incredible thinness. On the other hand excessive fat is no guarantee of health. Usually, however, the very thin patients will put on at least from ten to fifteen pounds in the course of a few months without apparent effort if otherwise satisfactory progress is being made."

Case,¹³ who has devoted serious consideration to this question, has stated that if the ileocecal mechanism is once incompetent it is always incompetent. This is doubtless true in the majority of cases, but not always, as indicated by a case reported by the writer,¹⁴ in which reexamination at the end of one and two years, of a patient with previously demonstrated ileal regurgitation, proved that the regurgitation was no longer present. Kellog,¹⁵ one of the few persons in this country who has taken ileocecal incompetence seriously, has even advised operation¹⁶ for the restoration of the ileocecal mechanism. Without discussing the actual merits of this procedure it may be stated that in practically all cases satisfactory results in the way of treatment have been obtained by the writer by non-surgical procedure. Numerous cases have been reexamined at various intervals after treatment. If the ileocecal mechanism is still found deficient it has at least been found to be much less so than at the original examination, and there has also been observed in every case a striking improvement in the general tone and action of the colon. One may therefore say in regard to operative treatment that it is usually unnecessary, since satisfactory results can be obtained without it and in the absence of the risks involved by operation.

VII. RESULTS OF TREATMENT. Application of the method of treatment outlined above has yielded the following results in the consecutive series of fifty chronic intestinal invalids upon which this paper is based.

† No improvement	6 per cent.
† Improvement	8 "
† Improvement plus	86 "
† Total improved	94 "

In the group of three cases constituting the 6 per cent. considered not improved is included one case with ileal regurgitation and concomitant diabetes. Treatment was practically refused for fear of upsetting the diabetic treatment. With this case excluded the percentage of cases in which no improvement in the general condition was obtained is obviously lower than 6 per cent. On the other hand the obtaining of a marked or satisfactory degree of improve-

ment in 86 per cent. of 50 cases, makes it possible to speak with some assurance concerning the prognosis, when first asked about this matter by a patient who may be in a state of mental perturbation as a consequence of frequent previous medical failures.

On the basis of the above results it is justifiable to tell the chronic intestinal invalid that he has a better than 90 per cent. prospect of improvement and a better than 80 per cent. prospect of being very much improved as a result of a few months of non-surgical treatment. This applies to the cases in which ileal regurgitation is proved. For the chronic intestinal invalid without ileal regurgitation progress should be proportionately more certain and more rapid.

VIII. SUMMARY. 1. Attention is drawn to the fact that responsible physicians refuse to become interested in a morbid condition with a history dating back to the Middle Ages.

2. The conditions associated with or resulting from ileal regurgitation do not favor optimum functioning of the gastro-intestinal tract.

3. The patient with ileal regurgitation usually suffers from an increased intensity of any nervous irritability to which he may be liable, during the continuance of untreated ileal regurgitation.

4. Immediate treatment of ileal regurgitation is by simple, bland, non-putrefying diet.

5. Adequate treatment must consider every aspect of the patient's welfare.

6. The results of treatment are indicated.

IX. CONCLUSIONS. 1. Ileal regurgitation is not a normal condition. Disregard of its existence does not promote health.

2. The existence of ileal regurgitation may be demonstrated with ease and certainty.

3. In unselected gastro-intestinal material a frequency of 20 to 30 per cent. of ileal regurgitation is to be expected. In a consecutive personal series of 50 chronic intestinal invalids the frequency of ileal regurgitation was 80 per cent.

4. Marked improvement in the general condition of 86 per cent. of this series of chronic intestinal invalids resulted from treatment directed in part toward relief from the results of the ileal regurgitation itself and directed in part toward improving the general condition of the patients.

5. With easy diagnosis assured and the possibility of obtaining satisfactory results by non-surgical treatment sufficiently demonstrated, the physician who prefers to continue to ignore the existence of ileal regurgitation may expect to have his patients suffering from ileal regurgitation take matters into their own hands if they find themselves continued in a medieval status of medical neglect with regard to progressive treatment of their malady.

REFERENCES.

1. Posthius: (1506) quoted by V. Haller, *Ekm. Physiol. Corp. Humane*, Lausanne, 1778, vii, 132.
2. Varolo: (1570) *Ibid.*
3. Coed: *The Study of Medicine*, London, 1822, i, 6.
4. Piccolomini: (1580) quoted by Kraus, *Arch. f. klin. Chir.*, 1802, xlv, 1410.
5. Hertz: *Wien. med. Wehnschr.*, 1807, xlvii, 1651 and 1701.
6. Cole: *Canadian Med. Assn. Jour.*, 1914, iv, 972.
7. Case: *Am. Jour. Roentgenol.*, 1914, ii, 370.
8. Cole: Personal Communication, May, 1920.
9. Baetjer: *Tr. Am. Gastro-enterol. Assn.*, 1920.
10. Bryant: *Boston Med. and Surg. Jour.*, 1915, clxxii, 321.
Boston Med. and Surg. Jour., 1915, clxxiii, 384.
Boston Med. and Surg. Jour., 1910, clxxiv, 412.
11. Hodskins: *Boston Med. and Surg. Jour.*, 1917, clxxvii, 87.
12. Bryant: *AM. JOUR. MED. SC.* (In process of publication.)
13. Case: *Surg., Gynec. and Obst.*, 1914, xix, 592.
14. Bryant: *Boston Med. and Surg. Jour.*, 1910, clxxv, 572.
15. Kellog: *Med. Rec.*, New York, 1913, lxxxiii, 1105.
Lancet-Clinic, 1915, cxliii, 602.
Med. Rec., New York, 1917, xcii, 309.
16. Kellog: *Surg., Gynec. and Obst.*, 1913, xvii, 503.
Ann. Surg., 1918, lxvii, 83.

THE SIGNIFICANCE OF SMALL AMOUNTS OF SUGAR IN THE URINE.

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THE clinical interpretation placed upon glycosuria has been subject to a constantly changing point of view for a number of years past. Not satisfied with the mere finding of sugar in the urine, clinical investigators first endeavored to determine the percentage content of the sugar, later the total amount excreted in twenty-four hours and still later by bringing this twenty-four-hour excretion into relation with the carbohydrate intake, they sought to ascertain the balance between this intake and the sugar output. After a time it was observed that not only carbohydrates but also proteins play a part in the production of glycosuria in advanced cases of diabetes, an observation which indicated the need of carefully balancing the total food intake against the sugar output for days and weeks as a scientific basis for diagnosis and therapy.

During this period it was generally understood that the healthy person excretes no sugar and that sugar in the urine is pathologic,